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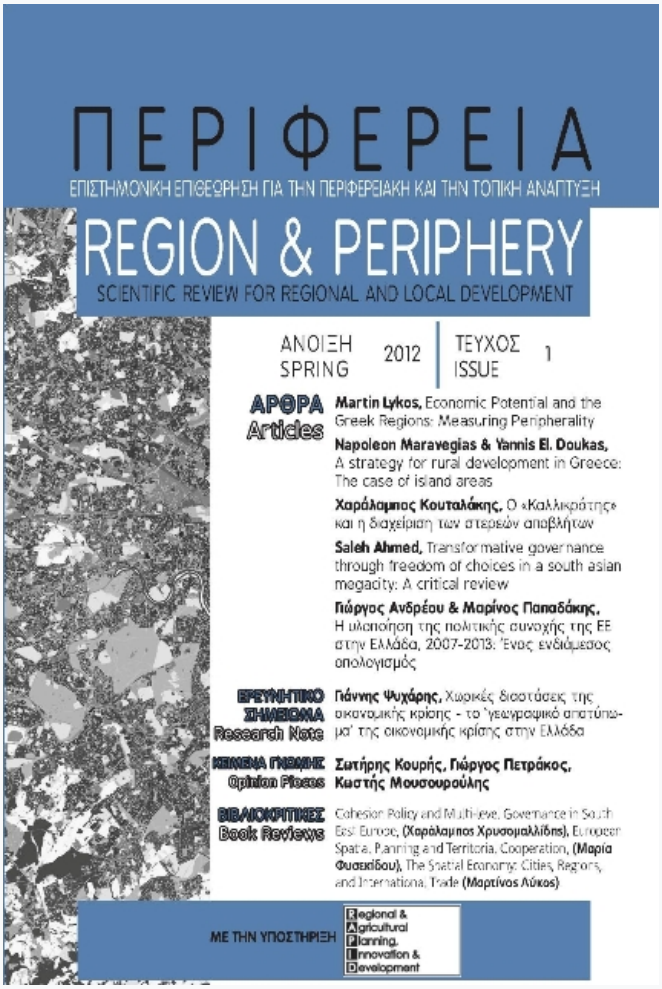

Οικονομική Δυναμική και Ελληνικές Περιφέρειες: Μέτρηση της Περιφερειακότητας

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Economic Potential and the Greek Regions: Measuring Peripherality

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ABSTRACT
This paper investigates spatial development in Greece in respect to the economic potential of its regions. Several statistical tools are used such as measurement of economic potential / peripherality scores of all Greek NUTS 3 regions. The economic centre of Attica / Athens determines economic potential all over the country, as proved by the output of the analysis. Lower peripherality rates are observed in Attica and its neighbouring prefectures, while higher in prefectures that combine remote position and limited local economic activity.

KEYWORDS: Economic potential, development, regions, peripherality

Οικονομική Δυναμική και Ελληνικές Περιφέρειες: Μέτρηση της Περιφερειακότητας

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ΠΕΡΙΛΗΨΗ
Η παρούσα μελέτη εξετάζει τη χωρική ανάπτυξη στην Ελλάδα σε συνάρτηση με την οικονομική δυναμική των περιφερειών της. Για αυτό το σκοπό χρησιμοποιούνται στατιστικά εργαλεία όπως η οικονομική δυναμική / περιφερειακότητα των ελληνικών περιφερειών επιπέδου NUTS 3. Το οικονομικό κέντρο της Αττικής / καθορίζει την οικονομική δυναμική στο υπόλοιπο της χώρας, όπως δείχνει η ανάλυση. Οι χαμηλότεροι δείκτες περιφερειακότητας εμφανίζονται στην Αττική και στους όμορούς της νομούς ενώ οι υψηλότεροι σε νομούς που συνδυάζουν ιδιαίτερα απόκεντρη θέση και χαμηλή εντόπια οικονομική δραστηριότητα.

ΛΕΞΕΙΣ-ΚΛΕΙΔΙΑ: Οικονομική δυναμική, ανάπτυξη, περιφέρειες, περιφερειακότητα

1. Introduction

Territorial cohesion in economic terms can be seen as a problem of spatial imbalance of economic activities. In Greece, the discussion about inequalities over space has been popular and controversial – especially among non experts. The fact is that regional inequalities form a structural characteristic of the Greek economy. No doubt this kind of problem is well known worldwide. Geographic constraints and production unevenness can describe the picture but cannot explain it. Regarding the balance between centripetal and centrifugal forces, the former tending to promote concentration and the latter to oppose it (Fujita et al, 1999: 9), in Greece there was always a clear tendency towards the former.

Both public and private sectors can be blamed for promoting the phenomenon of unequal territorial development – the question is whether or not such criticism is justifiable. For decades now there were significant inequalities in the flows of public investment across the Greek prefectures, without a clear pattern for the regional dispersion of it (Psycharis, 2008: 39). Private investment chooses locations that offer agglomeration economies, despite established counter-motives not to do so. Unbalanced growth seems to be fostered by a variety of reasons, and the results are depicted on official statistics.

Since Greece joined the EEC (now EU) in 1981, most attempts for balanced economic growth in the country have been connected to European regional / cohesion policy. Article 2 of the Treaty stated as goals of the European Union, "...to promote throughout the Community a harmonious, balanced and sustainable development of economic activities, a high level of employment and of social protection, equality between men and women, sustainable and non-inflationary growth, a high degree of competitiveness and convergence of economic performance, a high level of protection and improvement of the quality of the environment, the raising of the standard of living and quality of life, and economic and social cohesion and solidarity among Member States". This "commitment" has led European policy-making to the creation of regional policy dominated by a remedial approach to conventional peripherality through investment in physical infrastructure. (Copus, 2001: 547). Greece has been a classic example of regional policy implementation of this form.

Greece is traditionally considered as one of the most centralised countries in the European Union, unwilling to distribute power from its political centre to its periphery (Rodriguez – Pose 1998: 67). At the same time, Greece is one of the most remote countries of the Union, being a part of the European periphery. Since its accession to the EEC (1981) and for a period of twenty six years of full membership, Greece did not even have land borders with other member – states. This situation changed after EU's "expansion" in 2007. Even now, high peripherality continues to be a handicap. According to Copus (2000: 16), "...three developments are particularly relevant to defining concepts of peripherality:

(a) Improvements in transport and communications infrastructure, both through ongoing technological change and through publicly funded improvements in infrastructure.

(b) Structural changes, notably the continued expansion of the service sector and light manufacturing together with the decline of heavy manufacturing and primary production.
(c) The recent rapid technological change in the field of information society technology (IST) and the rapid growth of E-Commerce…".

European Union's economic targets clearly focus on cohesion. Infrastructure improvement has always been one of EU's major instruments towards this direction. According to the sixth progress report on economic and social cohesion of the European Commission (2009: 10), "…The goal of territorial cohesion is to encourage the harmonious and sustainable development of all territories by building on their territorial characteristics and resources.

The three basic elements proposed to achieve this goal were broadly supported:

- Concentration (achieving critical mass while addressing negative externalities),
- Connection (reinforcing the importance of efficient connections of lagging areas with growth centres through infrastructure and access to services), and
- Cooperation (working together across administrative boundaries to achieve synergies)…"

Two of these elements, proposed to achieve territorial cohesion, concentration, or how to achieve substantial economic mass, and connection, a factor highly related with networks, when combined, form what is called economic potential. Economic potential values represent a given location's access to economic activity after the cost of covering the distance to that activity has been accounted for (Keeble et al., 1982). Increasing regional product and decreasing the negative effects of distance are the obvious policy targets.

Infrastructure networks diminish distances but it is debated whether transport infrastructure contributes to regional polarisation or decentralisation. Suppose that a new motorway connects a peripheral and a central region. Now, it is possible for the producers in the peripheral region to expand their market limits in the metropolitan area. At the same time, the peripheral region is now exposed to the competition of more advanced products from the centre (Schürmann et al., 2002: 4). When targeting economic cohesion, decreasing distances is not necessarily a remedy – but the role of space is crucial anyway, being the basic constrain regarding human and commodity mobility.

Although "development" and "under-development" are notions depended on several variables, apart from economic ones like product / income / expenditure (see for example United Nation's Human Development Reports), the parameters used as evaluation tools for cohesion policy are always strictly economic (mostly GDP). Meanwhile, cohesion policy is very expensive and its effectiveness highly disputed. Territorial cohesion can be examined not only in European but also in national level by using the same statistical tools. This study examines the case of Greece.

2. Methodology

The analysis is based on the territorial structure created by the European Union official statistic authority (Eurostat). Eurostat has developed a multi-level regional structure known as NUTS (acronym for Nomenclature des Unités Territoriales Statistiques – Nomenclature of Territorial Units for Statistics). According to the NUTS structure, the Union is divided into 97 regions of a first spatial level (NUTS level 1), these regions into 271 smaller ones (NUTS 2), and consequently into 1.303 even smaller (NUTS 3). The "fragmentation" of the European space continues to the local level: NUTS 3 regions consist of 8.398 Local Authority Units (LAU level 1) and, finally, into 121.601 LAU 2 (structure valid in 2007) (Eurostat 2007: 14-15). As stated in Eurostat's official working papers, "...the NUTS nomenclature serves as a reference: a) for the collection, development and harmonisation of Community regional statistics: b) for socio-economic analyses of the regions and c) for the framing of Community regional policies (Eurostat 2007: 10-11)".

Following the previously described method, Greece is divided into 4 NUTS 1 regions, and consequently, into 13 and 51 regions of the next levels. In Greece, NUTS 1 level does not have administrative equivalent and is being used only for statistical reasons (named very generally "Groups of administrative regions"). NUTS 2 units form the Greek regional level ("Periferies"). NUTS 3 match the prefecture / sub-regional level ("Nomoi"). The territorial nomenclature continues to the local authority units: municipalities (or "Dimoi"– LAU level 1) and local authority departments (LAU 2). Note that Attica (or Attiki, according to the nomenclature), forms alone a NUTS 3, 2 and 1 spatial unit because of its demographic size (despite the fact that its area size is typical of a NUTS 3 unit).

This territorial nomenclature has been used extensively, if not exclusively, not only by the EU but also by the majority of independent researchers. Spieckermann and Neubauer (2002: 13) summarise the attempts for accessibility models (Table 1).

In the same manner, this study examines the Greek example and uses a widely accepted methodological framework, as follows:

– Territorial level: NUTS 3 ("Νομοί"). In administrative terms, 'Prefecture local authorities' since 31/12/2010. Most of them 'sub-regional departments' from 01/01/2011. Statistically speaking, this level offers a satisfying number of spatial units (51), significantly larger than NUTS 2 level (13), given that the case study (Greece) is a medium – small sized EU member. Even more important is that by using level 3 regions instead of 2, substantial intra-regional inequalities arise that otherwise remain invisible.

Table 1: Dimensions of European Accessibility Models

Authors	*Generic Indicator Type*	*Origins*	*Destinations*	*Impedance*	*Type of Transport*	*Modes*	*Spatial Scope*
Keeble et al (1982, 1988)	NUTS 2 centroids	Potential	GDP in NUTS 2 regions and in non-EU countries	Road Distance	-	Road	EU 9 EU 12
Lutter et al (1992, 1993)	NUTS 3 centroids	Travel cost Daily	194 centres next 3 agl. airports etc	Travel Time	Personal	Road Rail Air inter-modal	EU12
Spiekermann and Wegener (1994, 1996)	10 km raster cells	Daily potential	Population in 10 km raster cells	Travel Time	Personal	Rail	pan-Europe
Chatelus and Ulied (1995)	NUTS 2 centroids	Travel cost Daily	Population in NUTS 2 regions	Travel Cost	Personal freight	Road Rail Air inter-modal	EU 15 Norway Switzerland
Gutierres and Urbano (1995, 1996)	4.000 nodes	Travel cost	94 agglomerations	Travel Time	Personal	Road Rail	EU 12
Copus (1997, 1999)	NUTS 2 / NUTS 3 centroids	Potential	GDP, population, workforce in NUTS 2 / NUTS 3 regions	Travel Time	Personal	Road	EU 15 candidate countries Norway Switzerland
Wegener et al (2000, 2002)	NUTS 3 centroids	Potential	Population and GDP in 10 km raster cells	Travel Time	Personal	Road Rail Air	EU 15
Schürmann and Talaat (2000)	NUTS 3 centroids	Potential	GDP, population, workforce in NUTS 3 regions	Travel Time	Personal freight	Road	EU 15 candidate countries
Spiekermann et al (2002)	NUTS 3 centroids	Potential	Population in 10 km raster cells	Travel Time	Personal	Multi-modal (Road Rail, Air logsum)	EU 15

Source: Spieckermann and Neubauer (2002: 13)

– Economic criterion: Gross Domestic (Regional) Product, per capita, in Purchase Parity Standard (per capita GDP in PPS). GDP is by far the widest acceptable measure of economic activity. Spatial distribution of product is presented on all territorial levels (NUTS 1, 2 and 3) and examined in level 3.

– Spatial criterion: the distance between functional centroids (larger cities) of NUTS 3 regions. Concerning this criterion, it has been frequently argued in bibliography that transport cost is preferred to distance. Calculating transport costs always involves a variety of arbitrary assumptions with regard to cost measures, different types of transport and types of goods (Cieslik et al., 2004: 20). This is why here distance measurement means simply the distance between functional centroids, not "as the crow flies" but by road trip and / or ferry crossings (expressed in kilometers). "As the crow flies" approach is better to be used when traveling by plane is practically the only choice (e.g. for distances between capitals in the EU, state centroids in the US or internationally). In the Greek example, given the small territory under study and the fact that the majority of distances between prefecture centroids is well below 1.000 km (less than 1,5% of the cases exceed marginally the thousand km limit), this choice is obvious. Various software applications, like Google™ Earth, offer tools for estimating such data.

Potential models came to social sciences from physics. Estimation of economic potential, as the criterion for examining economic centrality or peripherality is based on an widely accepted typology in accessibility studies (between others Keeble et al.: 1981, 1988). Economic potential measures the accessibility to economic activity for a given point / region and, according to this method, the level of opportunity (accessibility), between a node i and a destination node j is positively related to the mass of the destination and inversely proportional to the distance between the two nodes (Gutiérrez 2001: 232). It is calculated by the following equation:

$$P_i = \sum_{j=1}^{n} \frac{M_j}{D_{ij}^{a}} \quad (1)$$

where P_i is the potential value for location i

M is an economic "mass" variable in location j

D_{ij} is the distance between locations i and j

a is a parameter (usually between 1 and 2) reflecting the rate of increase of the friction of distance (distance decay) (in most potential studies a = 1, and so does in this case).

Relevant approaches use travel time, or even travel cost, instead of distance. All methods have advantages and disadvantages. The classic method of distance is preferred here, despite its drawbacks, mainly the underestimation of island peripherality (travelling a given distance by boat takes more time than by car).

In the present example, inclusion of self-potential (one's region potential to the region itself) is necessary. Correct calculation of self-potential is critical because it is able to

over- or under-estimate the total value, depending on assumptions (Frost and Spence, 1995). Exclusion of self-potential produces underestimation of the total value, especially in metropolitan areas where economic mass is greatly concentrated. In these cases, small regions located close to large ones tend to give larger potential scores. The use of formula (1) for this purpose is impossible because when i=j, then Dij=0, leading to an invalid divide by zero. Literature offers some possible solutions to this problem like adding a constant to all distances to avoid Dii=0 or using an arbitrary fixed value to represent the average distance over which intrazonal contacts occur.

A more preferable method (applied here) is the following (Stewart, 1947: 477): Dii for a region itself can be estimated by using the radius of a circle that has the same area as region i. Various approaches use either the full value of such a radius, half of it, or one third (1 x, 0,5 x or 0,333 x the radius of an equivalent area circle for each region). Here, half the value (0,5 x r) is preferred (see also Stewart, 1947, Rich: 1980 amongst others). If the full radius was used (1 x r), some cases would be misleading: the distance from one functional centroid to another would be very close to, or even smaller than, intra-region values. For example, the distance between Trikala and Karditsa centroids is about 29,1 km whilst Trikala prefecture's equivalent circle radius equals 32,8 km (given that its area = 3.384 km^2). At the same time, one third of the radius (0,333 x r) is a value too small, especially when estimating self-potential of large NUTS 3 regions – in Attica, for instance, the already excessive self-potential value tends to represent almost 100% of the total.

Some necessary information, related to methodology:

- 13 of the 51 functional centroids in Greece are located on island territories. Two of them (Chalkida and Lefkada) are connected to the mainland by road (bridges). The rest of them are connected by ferries. In all cases, there are more than one possible sea routes to the islands, from different ports all over the country. The port of Piraeus (in conjunction with other Attica ports, such as Rafina, Lavrio etc) offers the largest variety of sea lines by far, especially during winter. Limited availability of the peripheral ports increases the time needed for reaching an island (e.g. if there is no everyday connection). This is why the ports of Attica are generally preferred, despite the fact that additional road trip may be needed. In this study, the ports of Attica are used only in the examples of the surrounding prefectures – for the rest parts of Greece the local ports are preferred, despite the limited availability. In general, this study clearly focuses on distance and not on time.
- All Gross Domestic Product data refer to the year 2008.
- All infrastructures (road networks etc) are as available at the time of writing.
- Functional centroid is the larger city of a region and not necessarily its administrative capital. In the vast majority of Greek "Nomoi" these two features co-exist but in five cases do not. These cases are: Voiotia (where functional centroid is Thiva, instead of prefecture capital Livadia), Aitoloakarnania (Agrinio instead of Messologgi), Pella (Giannitsa instead of Edessa), Lasithi (Ierapetra instead of Agios Nikolaos), Argolida (Argos instead of Nafplio).

– Total number of distances between centroids is 1.326 (51 + 50 + ... + 1), including 51 intra-regional distance values used for self-potential estimates.

– Economic potential scores individually calculated for all cases are in total 2.601 (51 tables containing 51 values each). [All relevant data, impossible to present here for practical reasons, is available upon request].

Regarding the statistical analysis, the covariant coefficient formula used is the following:

(2) $$p_{x,y} = \frac{Cov(X, Y)}{\sigma_x \cdot \sigma_y}$$

where:

(3) $$Cov(X, Y) = \frac{1}{n}\sum_{i=1}^{n}(x_i - \mu_x)(y_i - \mu_y)$$

The coefficient varies between:

$$-1 \leq p_{x,y} \leq 1$$

where -1 value stands for total negative, 0 for non-existent and +1 for total positive covariance between values x and y.

3. Measuring of Economic Potential

Eurostat offers a very extensive database with regard to Gross Domestic Product, in all its forms (in total or per capita, in absolute values or in purchase parity standard etc). Table 2 shows most recent data for Gross Domestic Product in current market prices for all levels of the territorial structure in Greece. On this table data are presented in millions of euro. The most recent year available is 2008 and has been used as reference in the analysis that follows.

According to these data, Greece's Gross Domestic Product in current market prices is recorded at 236.917 million euros (Note: Hellenic Statistical Authority recently re-estimated this figure at 232.920 million euros, without regional analysis). Attica's GDP, 103.334 million euros, represents 43,6% of the national production, proving heavy concentration of economic production in an area that counts for only 2,9 % of the total national space. The rest of the country produced 133.583 million euros or 56,4% of the total. At NUTS 1 regional level (Groups of Development Regions), apart from Attiki, one fourth of the national GDP is being produced in Voreia Ellada (Northern Greece, including Thessaly). Kentriki Ellada (excluding Attica) produces one fifth of the total while the rest is the product of the Aegean Islands, including Crete (Nisia Aigaiou – Kriti). At NUTS level 2, Kentriki Macedonia represents more than half of Voreia Ellada, while the rest of the country seems equally distributed with many examples around 12.000 million euros. At the low end there are two very small regions, having size more adequate for level 3 units, Voreio Aigaio and Ionia Nisia. At NUTS level 3,

the prefectures that contain large urban areas stand at top, especially Thessaloniki (with 23,1 billions of euro GDP) being well above Iraklio and Achaia (that follow with 6,7 billions each). At the lower end we find small island or mountainous prefectures with limited demographic base and, as a consequence, small GDP.

Following the methodology presented in part 2, a series of 51 tables was created, one table for each NUTS 3 unit. Economic potential score for every one in separate was calculated by using formula (1). The final values are presented in Table 2.

Lowest peripherality in Greece (expressed as high economic potential) is found in Attiki. Attiki has an index value almost three times higher than the second one (Voiotia) thanks to its impressive proportion of self-potential (that exceeds 92% of the total value). The neighbouring Voiotia, Evvoia and Korinthia follow from a big distance, along with Thessaloniki (found at 3rd place overall). High peripherality values (expressed as low economic potential) are found in NUTS 3 regions that combine two features: big distance from Attica and small local economic activity (eg. Evros, Rodopi, Lasithi, Lesvos, Samos, Florina).

Attica is the dominant component for 40 of the 51 prefectures. Many times its influence is excessive – that makes sense, taking into account that most Greek prefectures are small local economies, highly depended on Athens' market. There are eleven examples where Attica, although important, is not the dominant part that affects the potential values. Thessaloniki is the most influential component for seven NUTS 3 units. These cases (Serres, Pieria, Imathia, Pella, Chalkidiki, Kilkis and Thessaloniki itself) totally match with the seven prefectures that form the region of Kentriki Makedonia (Central Macedonia). In these cases, direct proximity to the second most important economic centre of the country is more important than the big difference of economic mass between Attiki and Thessaloniki (the former being 4,5 times bigger than the latter – see Table 1). The four remaining examples are Iraklio, Kerkyra, Dodekanisos and Kavala where self-potential is higher than the contribution of any other prefecture.

The proportion of self-potential in Attiki, as already stated, is an impressive 92%. High self-potential is a frequent phenomenon in metropolitan centres (Gutiérrez, 2001: 234), although not to this extent. Even in case that the full radius of Attica's area was used, self potential proportion would be estimated 86% – in case of 1/3 the radius the proportion is close to 95%. This is explicable by the simple fact that the metropolitan region produces a vast proportion of Greece's GDP. High self-potential proportion is also found at the largest the Greek "Nomoi", but values fall as GDP falls, i.e Thessaloniki: 66%, Iraklio: 45% and Achaia: 32%. In Thessaloniki, local economy is by far the largest in its neighbourhood and the distance from Athens is rather big. Iraklio's self-potential is also high because of its significant economic size plus its remoteness – the remaining prefectures do not add much potential to the local economy. Achaia's relatively small proportion can be explained basically by its proximity to Athens – in Achaia, Attica's potential is marginally bigger than self-potential or, in other words, Athens' influence exceeds the self-influence of Patras. Dodekanisos' (44%) and Kerkyra's (37%) proportion is also high because of their remoteness and relatively high local activity. Low values of self-potential are found mainly between low income prefectures and at those close to Attica.

Table 2: GDP at current market prices – millions of euro – GR NUTS 0, 1, 2, 3 – 1999 to 2008

	2008	2007	2006	2005	2004	2003	2002	2001	2000	1999
GREECE	**236917**	227074	211300	194819	185266	172431	156615	146428	137929	131936
VOREIA ELLADA	**62981**	61323	57377	53968	51547	47445	42837	40785	38925	40652
Anat. Makedonia, Thraki	**9054**	8801	8033	7863	7412	6987	6293	6220	5716	5790
Evros	**2370**	2434	2115	2096	1956	1925	1653	1608	1598	1549
Xanthi	**1583**	1561	1442	1362	1301	1213	1040	1097	984	975
Rodopi	**1514**	1502	1363	1295	1251	1194	1165	1194	912	903
Drama	**1442**	1324	1254	1258	1233	1102	990	954	905	846
Kavala	**2145**	1980	1859	1852	1672	1553	1446	1367	1316	1516
Kentriki Makedonia	**35458**	34475	32372	30244	28874	26283	23700	22660	21884	23032
Imathia	**2401**	2157	2184	2032	1974	1829	1664	1717	1801	1494
Thessaloniki	**23139**	22812	21011	19635	18774	16884	15171	14417	13833	15122
Kilkis	**1549**	1415	1396	1297	1188	1206	1023	999	950	964
Pella	**2302**	2235	2098	1948	1836	1736	1615	1465	1379	1397
Pieria	**1915**	1809	1707	1692	1624	1510	1358	1341	1233	1124
Serres	**2349**	2283	2299	2072	2026	1831	1715	1611	1614	1632
Chalkidiki	**1803**	1765	1677	1568	1452	1287	1153	1111	1073	1298
Dytiki Makedonia	**5564**	5637	5268	4828	4378	4154	3905	3488	3371	3718
Grevena	**519**	599	570	491	375	353	341	322	289	388
Kastoria	**1147**	1117	1139	955	848	777	736	641	581	593
Kozani	**3008**	3074	2741	2602	2437	2338	2218	1963	1948	2141
Florina	**890**	846	817	780	718	685	611	563	553	596
Thessalia	**12905**	12410	11704	11034	10883	10021	8938	8416	7954	8112
Karditsa	**1587**	1498	1498	1426	1344	1252	1172	1040	977	1181
Larisa	**5221**	5092	4722	4443	4499	4204	3627	3549	3351	3269
Magnisia	**4047**	3876	3646	3407	3308	3104	2782	2637	2479	2352
Trikala	**2050**	1944	1838	1758	1732	1461	1358	1190	1148	1311
KENTRIKI ELLADA	**46354**	44832	41658	38940	36862	34541	31590	30220	29232	28752
Ipeiros	**5827**	5748	5379	4949	4836	4433	3945	3772	3594	3277
Arta	**901**	903	840	833	756	776	684	665	613	602
Thesprotia	**722**	660	659	640	621	595	522	523	466	387
Ioannina	**3263**	3278	3010	2676	2638	2296	2015	1889	1830	1730
Preveza	**940**	907	870	800	822	766	724	695	685	557

Ionia Nisia	**4646**	4461	4147	3870	3590	3374	3016	2777	2562	2287
Zakynthos	**1031**	1028	896	859	804	703	661	613	555	354
Kerkyra	**2458**	2315	2240	2072	1890	1802	1577	1413	1348	1260
Kefallinia	**743**	720	650	589	566	575	516	499	433	399
Lefkada	**414**	398	361	350	330	294	261	252	225	274
Dytiki Ellada	**12122**	11705	10788	9908	9609	9018	8087	7608	7145	6785
Aitoloakarnania	**3214**	3249	3027	2707	2610	2297	2157	2145	2035	2016
Achaia	**6668**	6330	5767	5339	5076	4874	4363	3990	3674	3355
Ileia	**2240**	2125	1993	1863	1923	1846	1567	1472	1436	1414
Sterea Ellada	**12530**	11958	10958	10708	9897	9370	8817	8608	8485	9435
Voiotia	**3929**	3774	3398	3519	3326	3337	3330	3378	3323	3785
Evvoia	**4185**	3801	3806	3567	3323	3062	2692	2455	2375	2548
Evrytania	**266**	279	253	235	228	206	205	202	196	277
Fthiotida	**3476**	3465	2874	2809	2486	2281	2148	2159	2159	2285
Fokida	**674**	638	627	578	535	484	442	415	431	540
Peloponnisos	**11230**	10961	10386	9505	8929	8346	7725	7455	7447	6967
Argolida	**1946**	1923	1737	1638	1503	1413	1313	1175	1167	1120
Arkadia	**1981**	1937	1802	1642	1522	1428	1356	1296	1263	1210
Korinthia	**3279**	3178	3126	2903	2595	2485	2402	2533	2669	2322
Lakonia	**1339**	1296	1262	1156	1172	1040	997	945	824	869
Messinia	**2684**	2627	2459	2166	2137	1980	1657	1507	1523	1445
ATTIKI	**103334**	97670	90492	82265	78432	72861	66107	60442	55676	48895
NISIA AGAIOU, KRITI	**24248**	23249	21773	19646	18424	17584	16082	14981	14097	13636
Voreio Aigaio	**3579**	3493	3307	2925	2850	2831	2436	2432	2093	2296
Lesvos	**1832**	1797	1705	1526	1462	1445	1239	1232	1052	1343
Samos	**746**	712	662	601	547	541	512	501	431	441
Chios	**1000**	985	939	798	841	846	686	699	609	512
Notio Aigaio	**7816**	7499	7021	6190	5844	5585	5093	4754	4585	4237
Dodekanisos	**4794**	4668	4246	3670	3361	3350	3088	2901	2855	2842
Kyklades	**3022**	2831	2775	2519	2483	2235	2005	1853	1730	1395
Kriti	**12854**	12257	11446	10531	9730	9168	8552	7795	7419	7103
Irakleio	**6692**	6254	6038	5428	5057	4755	4429	3959	3753	3310
Lasithi	**1657**	1575	1422	1335	1150	1105	1051	1008	948	1043
Rethymni	**1541**	1489	1333	1398	1234	1159	1094	1009	1024	955
Chania	**2965**	2940	2653	2370	2289	2149	1978	1818	1694	1796

Note: Hellenic Statistical Authority recently re-estimated Greek national gdp data, without regional analysis, as follows: 2008: 232.920, 2007: 222.771, 2006: 208.893, 2005: 193.050

Source: Eurostat Database (data retrieved on 28/02/2011)

Table 3: Economic Potential Score (accessibilitiy to GDP by road/ferry)– Greece, NUTS 3 (2008)

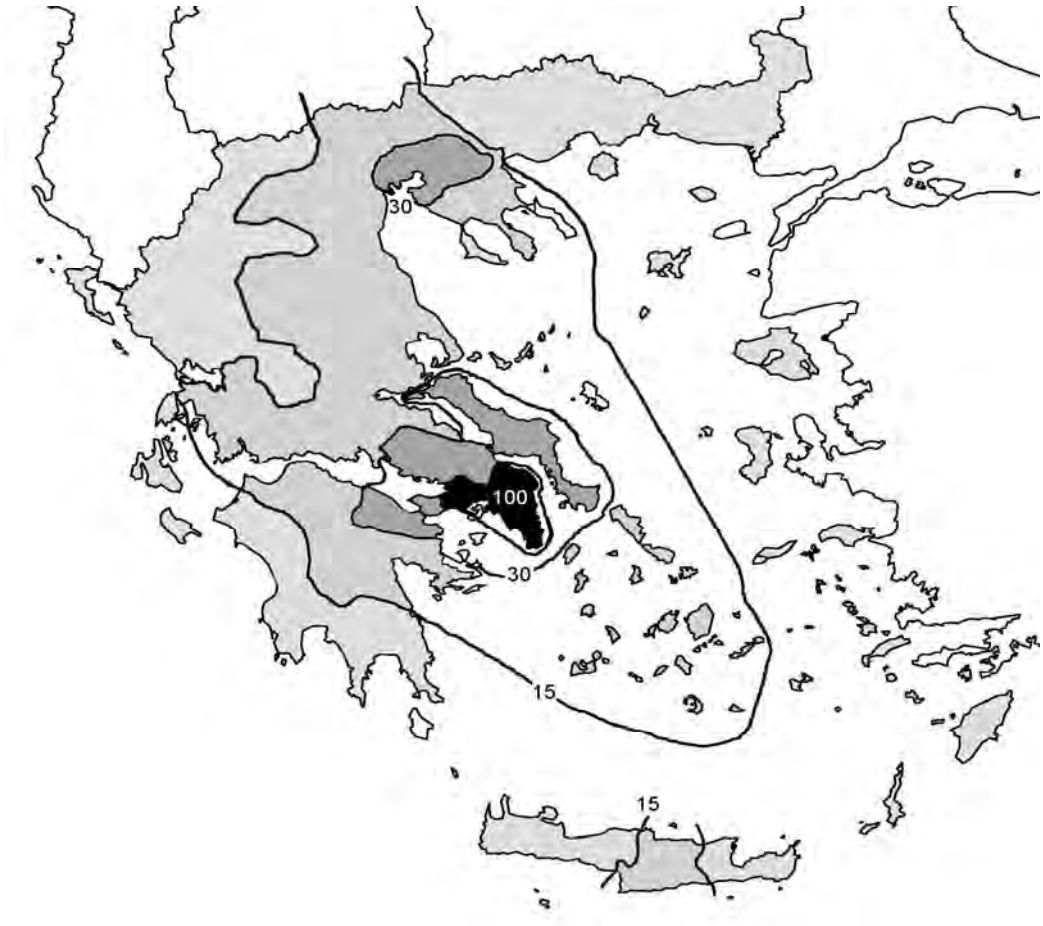
#	*NUTS 3 Region*	*Functional Centroid*	*Mass GDP (mil €)*	*Distance*	*Score*	*Score as % of max value*
1.	Attiki	Athens	103.333,8	[51 values]	6.438	100,00
2.	Voiotia	Thiva	3.928,9	[51 values]	2.219	34,47
3.	Thessaloniki	Thessaloniki	23.138,9	[51 values]	2.044	31,74
4.	Evvoia	Chalkida	4.185,0	[51 values]	2.032	31,56
5.	Korinthia	Korinthos	3.278,8	[51 values]	1.965	30,53
6.	Argolida	Argos	1.946,2	[51 values]	1.435	22,29
7.	Achaia	Patra	6.668,0	[51 values]	1.284	19,95
8.	Pella	Giannitsa	2.302,5	[51 values]	1.213	18,84
9.	Kyklades	Ermoupoli	3.021,9	[51 values]	1.212	18,83
10.	Arkadia	Tripoli	1.981,4	[51 values]	1.202	18,67
11.	Fthiotida	Lamia	3.475,6	[51 values]	1.183	18,38
12.	Pieria	Katerini	1.915,3	[51 values]	1.180	18,33
13.	Imathia	Veroia	2.400,8	[51 values]	1.172	18,21
14.	Larisa	Larisa	5.221,0	[51 values]	1.167	18,12
15.	Kilkis	Kilkis	1.548,8	[51 values]	1.145	17,79
16.	Magnisia	Volos	4.047,1	[51 values]	1.138	17,67
17.	Karditsa	Karditsa	1.586,9	[51 values]	1.116	17,33
18.	Fokida	Amfissa	674,2	[51 values]	1.094	17,00
19.	Trikala	Trikala	2.050,3	[51 values]	1.057	16,42
20.	Irakleio	Iraklio	6.691,6	[51 values]	1.024	15,91
21.	Kozani	Kozani	3.008,4	[51 values]	1.022	15,87
22.	Chalkidiki	Polygyros	1.803,5	[51 values]	1.019	15,83
23.	Aitoloakarnania	Agrinio	3.214,1	[51 values]	1.005	15,61
24.	Lakonia	Sparti	1.339,1	[51 values]	958	14,88
25.	Messinia	Kalamata	2.684,2	[51 values]	952	14,78
26.	Kerkyra	Kerkyra	2.458,3	[51 values]	941	14,62
27.	Serres	Serres	2.348,6	[51 values]	939	14,59
28.	Ileia	Pyrgos	2.239,8	[51 values]	931	14,46
29.	Grevena	Grevena	518,8	[51 values]	913	14,18
30.	Evrytania	Karpenisi	266,2	[51 values]	906	14,07
31.	Zakynthos	Zakynthos	1.031,1	[51 values]	891	13,84

32.	Ioannina	Ioannina	3.263,3	[51 values]	884	13,73
33.	Arta	Arta	901,1	[51 values]	881	13,69
34.	Preveza	Preveza	939,8	[51 values]	879	13,64
35.	Lefkada	Lefkada	413,8	[51 values]	840	13,05
36.	Kavala	Kavala	2.145,2	[51 values]	825	12,81
37.	Chania	Chania	2.964,8	[51 values]	824	12,80
38.	Rethymni	Rethymno	1.540,8	[51 values]	818	12,70
39.	Chios	Chios	1.000,5	[51 values]	808	12,55
40.	Kefallinia	Argostoli	742,6	[51 values]	798	12,40
41.	Thesprotia	Igoumenitsa	722,5	[51 values]	781	12,14
42.	Drama	Drama	1.442,1	[51 values]	762	11,84
43.	Kastoria	Kastoria	1.146,6	[51 values]	759	11,79
44.	Dodekanisos	Rodos	4.793,8	[51 values]	738	11,47
45.	Xanthi	Xanthi	1.582,5	[51 values]	711	11,04
46.	Florina	Florina	890,0	[51 values]	699	10,86
47.	Samos	Vathy	746,1	[51 values]	693	10,77
48.	Lesvos	Mytilini	1.832,1	[51 values]	686	10,66
49.	Lasithi	Ierapetra	1.656,7	[51 values]	644	10,01
50.	Rodopi	Komotini	1.514,4	[51 values]	636	9,88
51.	Evros	Alexandroupoli	2.369,5	[51 values]	571	8,86

Note: highest potential = less peripheral, lowest potential = most peripheral

Source: own estimation

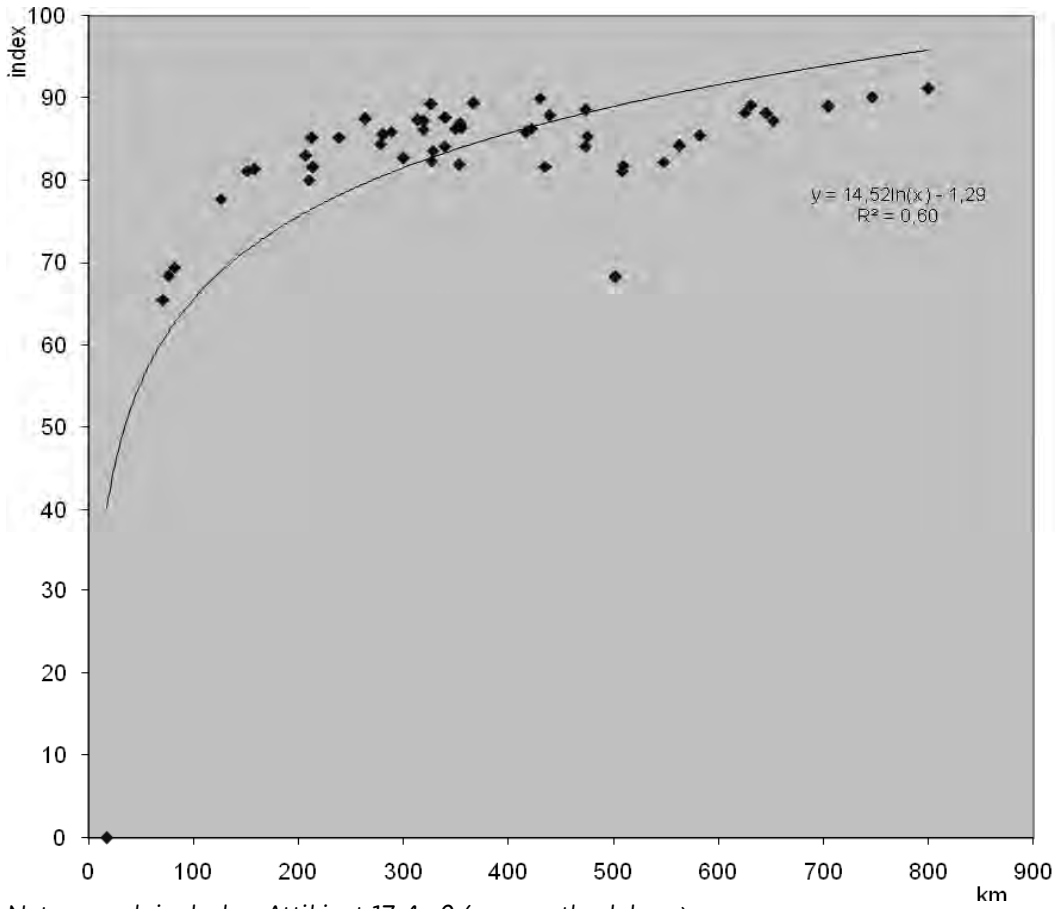
Map 1: Economic Potential surfaces (accessibilitiy to GDP by road/ferry) - Greece (2008)



Note: normalised, range min = 0, max = 100

Source: own processed (map base: Eurostat – GISCO, 03/1999)

Chart 1: Peripherality and distance from Athens – Greece, NUTS 3 (2008)



Note: graph includes Attiki at 17,4 : 0 (see methodology)

Source: own estimation

Map 1 – based on table 2 – illustrates equal value surfaces of economic potential in Greece, as a percentage of Attica's value (that is the maximum, = 100). Attica's surrounding prefectures form a high potential ring around it – Evvoia, Korinthia, and, especially, Voiotia – thanks to their proximity to Athens. At the rest of the country, relatively high values are found along an axis almost identical to P.A.TH.E. highway (Patras, Athens, Thessaloniki, Evzoni), with a local peak at Thessaloniki. Another local peak, lower than the previous, is found at Iraklio.

Chart 1 presents the distribution of Greek peripherality index (y-axis) in relation to distance from Athens (x-axis) (methodology after Copus 1999: 24 – EU peripherality index by distance from Paris). Peripherality in this case is considered the exact opposite of potential (in numerical form: peripherality = 1 – potential, after normalising to a 0 – 100 scale). The correlation value is a moderate positive 0,48. The logarithmic trend-line of the previous correlation is: $y = 14{,}52\ln(x) - 1{,}29$ ($R^2 = 0{,}60$).

4. Conclusions

This paper presented territorial dispersion of product in Greece, examined cohesion problems over space and estimated economic potential of the Greek regions. Some concluding remarks:

- Economic activity in Greece is heavily concentrated. Attiki occupies only 2,9% of the country's area but produces 43,6% of Greece's GDP (2008). In comparison, the NUTS 3 spatial units that follow at the second and third place produce 9,8% and 2,8% of the national GDP respectively.
- Attica's economic performance is significantly higher when compared to the majority of the country's NUTS structure (being the metropolitan region, this phenomenon is well known worldwide). Greece's GDP per inhabitant in purchase power standard (PPS) equals 94% of the EU 27 average. Attiki is recorded at 113% of EU 27 average. Without Attiki, the rest of the country equals approximately 83% of EU's average.
- The previous conditions result in an economic potential value for Attiki much higher than the ones found away from it. The gap ranges from 3X the value of the second example (Viotia) to 11X the value of the last one (Evros) on the relevant list.
- Excluding Attica, relatively high economic potential is found in its three neighbouring prefectures, Viotia, Evia and Korinthia, thanks to their proximity to the metropolitan centre. At the rest of the country, in a relatively better position are areas around P.A.TH.E. axis and especially Thessaloniki that scores higher among them (3rd place overall). Another local peak is found at Iraklio, Crete.
- In contrast, low economic potential is the characteristic of NUTS 3 regions that combine large distance from Athens / Attica and limited local economic activity: in Thrace (Evros, Rodopi, Xanthi), Western Macedonia (Florina, Kastoria), and some island territories (Lasithi, Lesvos, Samos, Dodekanisos).

Attica's economic domination clearly determines potential / peripherality values all over the Greek space because of its vast contribution to the national GDP. Under these circumstances, local analysis of potential around regional centres can be proved equally useful.

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